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## THE GENUS GRYLLUS (ORTHOPTERA) AS FOUND IN AMERICA.

BY JAMES A. G. REHN AND MORGAN HEBARD.

To the systematic orthopterist, the crickets of the genus *Gryllus* have proven to be one of the greatest stumbling-blocks in the order. This is true of the forms found in both hemispheres, but this assertion has especial emphasis when the American forms alone are considered. This is not due to a lack of study, as Scudder and Blatchley have in recent years both endeavored to diagnose certain or all of at least the North American species, using what might be called "conventional" morphological characters, while Lutz, approaching the subject from a biometric point of view, concludes that species in an anyway natural sense do not exist in the genus, in this skepticism representing the other extreme from Scudder, who categorically defines a number of species.

The present authors have been unable in the past to approach the subject with sufficient material to enable them to do more than endeavor to assign certain of their series to various of the forms recognized by Scudder. There has been constant and increasing difficulty in doing this, as, while some individuals would fit certain of the specific descriptions, others would be found agreeing in various features with two or more of the specific diagnoses, the sum total of almost any representation showing an endless complexity of the characters used to differentiate the numerous described forms.

The fact is quickly recognizable that almost all of the descriptions of these species were chiefly concerned with size, coloration (not color pattern), venation (in number of transverse (oblique of Saussure) veins in the male tegmen and number of branches of the mediastine vein in both sexes), tegminal length, degree of development of wings and ovipositor length. Such factors have been found to be of minor importance or of no specific value whatsoever in certain other related genera, and the natural uncertainty of the status of the American forms has led us to undertake a more searching study of these. This work is based on all of the American material of the genus before us, 1,504 specimens. The results explain to our complete satisfaction the reasons for the past confusion, a summary of which is given below.

The genus *Gryllus* is found in America everywhere from southern Canada to Patagonia. Many forms are developed, distinctive in appearance to different degrees, but possessing in not a single instance valid and constant specific characters, with the exception of *Gryllus domesticus*, a distinctive introduced species.

The different manifestations of the only native American species, *Gryllus assimilis*, are in no case sufficiently differentiated or constant to be considered geographic races. They constitute mere variations, the adaptation of this exceedingly plastic species to local environmental conditions. All are in varying degrees unstable,<sup>1</sup> but certain geographic limits naturally bound the distribution of each, thus desert adaptations, such as those described as *personatus* and *armatus*, are never found in the well watered portions of the continent, nor is the tropical adaptation, *assimilis*, found in the extreme northern or southern portions of the range of the species. This is of course explained by the fact that the environmental conditions producing these variants are not found over portions of the range of the species.

The work of Lutz<sup>2</sup> has already demonstrated the error of using length of tegmina, wings and ovipositor as characters of specific importance in the genus *Gryllus*. The mass of evidence upon these features in Lutz's paper is absolutely convincing; from studies of other genera we have found such characters to be of minor importance generally throughout the Orthoptera. Finding no other characters which could warrant specific distinctions in the mass of American material which he carefully bred and studied, Lutz has, however, stated that all the forms of *Gryllus* are conspecific. His examination of the series of females of the genus in the British Museum should have shown him the error of this opinion, but he apparently confined his studies to the variations in organs of flight and ovipositor,<sup>3</sup>

<sup>1</sup> Of these, the *personatus* variant, showing the maximum condition of desert adaptation, constitutes the nearest approach to a geographic racial development. No intergradation is to be found with the more northern variants or with the other desert adaptation, *armatus*, found also in the arid regions of the southwestern United States, which latter appears to be derived from the northern variants, various conditions of which are found in the higher mountains everywhere in the region under consideration. The *personatus* variant, however, normally very pale in general coloration, is found to be occasionally much darker, and from along the Mexican border such specimens are before us showing the transition to, and the typical condition of, the *mexicanus* variant.

<sup>2</sup> The Variation and Correlations of Certain Taxonomic Characters of *Gryllus*, pp. 1 to 63 (1908.)

<sup>3</sup> In length of ovipositor, however variable, different extremes are found for each distinct species. For many species these differences may be negligible, but for some species the maximum and minimum are very different. Such features, however, can only be accurately ascertained after specific units have been located through the use of definite valid specific characters. Thus, in the study of females

overlooking characters of real specific value in the exotic series of *Gryllus*.<sup>4</sup>

*Gryllus assimilis* (Fabricius).

- 1775. [*Acheta assimilis*] Fabricius, Syst. Ent., p. 280. [Jamaica.]
- 1838. *Gr[yllus] pennsylvanicus* Burmeister, Handb. Ent., II, abth. II, pt. 1, p. 734. [Pennsylvania.]
- 1839. *Gryllus luctuosus* Serville, Hist. Nat. Ins., Orth., p. 335. [ $\sigma$ , ♀ : North America.]
- 1839. *Gryllus abbreviatus* Serville, *ibid.*, p. 336. [♀ : North America.]
- 1841. *Acheta nigra* Harris, Ins. Inj. Veget., 1st ed., p. 123. [New England.]
- 1854. *Gryllus fulvipennis* Blanchard, Hist. Chile, Zool., VI, p. 32. [ $\sigma$ , ♀ : Valparaiso, Coquimbo, etc., Chile.]
- 1858. *Gryllus lineaticeps* Stål, Kongl. Svensk. Freg. Eug. Resa, Zool., I, p. 314. [♀ : San Francisco, California.]
- 1859. *Gr[yllus] aztecus* Saussure, Rev. Mag. Zool., 2<sup>e</sup> ser., XI, p. 316. [♀ : Mexico.]
- 1859. *Gr[yllus] cubensis* Saussure, *ibid.*, p. 316. [Cuba.]
- 1859. *Gr[yllus] mexicanus* Saussure, *ibid.*, p. 316. [Mexico.]
- 1862. *Gryllus angustus* Scudder, Bost. Journ. Nat. Hist., VII, p. 427. [3 ♀, Cambridge and Cape Cod, Massachusetts.]
- 1862. *Gryllus neglectus* Scudder, *ibid.*, p. 428. [ $\sigma$ , ♀ : Massachusetts and Cape Cod, Massachusetts.]
- 1864. *Gryllus personatus* Uhler, Proc. Ent. Soc. Phila., II, p. 547. [1 ♀ : Kansas.]
- 1869. *Gryllus septentrionalis* Walker, Cat. Dermapt. Saltat. Br. Mus., I, p. 18. [ $\sigma$ , ♀ : Oajaca, Mexico; west coast of South America; San Domingo.]
- 1869. *Gryllus luridus* Walker, *ibid.*, p. 18. [♀ : Vera Cruz, Mexico.]
- 1869. *Gryllus determinatus* Walker, *ibid.*, p. 19. [ $\sigma$ , ♀ : Jamaica; St. Vincent; San Domingo.]
- 1869. *Gryllus parvulus* Walker, *ibid.*, p. 20. [ $\sigma$  : St. Vincent; Brazil.]
- 1869. *Gryllus similaris* Walker, *ibid.*, p. 20. [♀ : San Domingo.]
- 1869. *Gryllus augustulus* Walker, *ibid.*, p. 21. [ $\sigma$ , ♀ : Jamaica; St. Vincent.]
- 1869. *Gryllus contingens* Walker, *ibid.*, p. 21. [♀ : St. Vincent; Brazil.]
- 1869. *Gryllus signatipes* Walker, *ibid.*, p. 22. [ $\sigma$  : west coast of America.]
- 1869. *Gryllus comptus* Walker, *ibid.*, p. 23. [ $\sigma$  : Constancia, Brazil.]

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of *Gryllus* in the British Museum, Lutz confined himself to biometric observations and failed to recognize the specific units involved. The extremes of ovipositor length for this series showed a minimum of 5 mm., which is decidedly shorter than ever found in *Gryllus assimilis* (10.5 to 25.5 mm. in material studied by him, unquestionably referable to *assimilis*, and in our present series 11.2 to 23.2 mm.). In most series of the species we find the great majority of specimens to show an ovipositor length measuring between 12.5 and 21.5 mm.).

\* Lutz also briefly discusses the genus *Atlanticus* in his paper, where from a few specimens it is assumed that similar variations in length of ovipositor and caudal femora exist, such variations demonstrating, in his opinion, the invalidity of the two species for which the names *Atlanticus pachymerus* and *dorsalis* had been used. This conclusion is without foundation, as he totally overlooked the fact that independent of general bulk these two species are separable by excellent morphological characters. Recent studies based upon examples of *Atlanticus* show that at least nine distinct specific units exist, each showing some variation, it is true, in the length of the ovipositor and to a lesser degree of the caudal femora, but the forms have excellent genital and other morphological characters, each species being far less plastic than *Gryllus assimilis*. This would be, in part, the explanation of Lutz's position regarding the Old World forms of *Gryllus*. A deeper study than biometric measurements of two dimensions in these forms would have shown excellent morphological characters for a number of species.

1869. *Gryllus mundus* Walker, *ibid.*, p. 23. [♀ : Brazil.]  
 1869. *Gryllus signatus* Walker, *ibid.*, p. 24. [♀ : Venezuela.]  
 1869. *Gryllus vicarius* Walker, *ibid.*, p. 24. [♂ : Pará, Brazil.]  
 1871. *Gryllus debilis* Walker, Cat. Dermapt. Saltat. Br. Mus., V, Suppl., p. 4. [♂ : Chontales, Nicaragua.]  
 1874. *Gryllus argentinus* Saussure, Miss. Sci. Mex., Rech. Zool., VI, p. 399. [♂, ♀ : Brazil; Tarma, Peru; northern Patagonia; Buenos Aires, Bahia Blanca and Rio Negro de Patagonas, Argentina.]  
 1874. *Gryllus scudderianus* Saussure, *ibid.*, p. 402. [♂, ♀ : North America.]  
 1874. *Gryllus capitatus* Saussure, *ibid.*, p. 405. [♂ : Peru; Chile.]  
 1874. *Gryllus bicolor* Saussure, *ibid.*, p. 405. [♂, ♀ : Monte Rico, Guiana.]  
 1874. *Gryllus peruviensis* Saussure, *ibid.*, p. 406. [♂ : Moyabamba, Peru.]  
 1874. *Gryllus forticeps* Saussure, *ibid.*, p. 407. [♂, ♀ : Brazil.]  
 1876. *Gryllus insularis* Scudder, Proc. Bost. Soc. Nat. Hist., XVIII, p. 268. [1 ♂, 2 ♀ : Guadalupe Island, Lower California.]  
 1877. *Gryllus miopteryx* Saussure, Mélang. Orthopt., fasc. V, p. 320. [♀ : Peru.]  
 1893. *Gryllus galapageius* Scudder, Bull. Mus. Comp. Zool., XXXV, p. 22. [♀ : Albemarle Island, Galapagos Islands.]  
 1897. *Gryllus assimilis* variety *pallidus* Saussure, Biol. Cent.-Amer., Orth., I, p. 226. [Durango, Mexico; Presidio de Mazatlán, Sinaloa, Mexico.]  
 1897. *Gryllus chichimecus* Saussure, *ibid.*, p. 226. [♂, ♀ : Ciudad, Durango, Mexico, 8100 feet.]  
 1901. *Gryllus barretti* Rehn, Trans. Am. Ent. Soc., XXVII, p. 221. (May) [1 ♂, 3 ♀ : Cuernavaca, Mexico.]  
 1901. *Gryllus vocalis* Scudder, Psyche, IX, pp. 267, 268. (Nov.) [♂, ♀ : Palm Springs and Los Angeles, California.]  
 1901. *Gryllus integer* Scudder, *ibid.*, pp. 267, 268. [♂, ♀ : West Berkeley to San Diego, California.]  
 1902. *Gryllus armatus* Scudder, Psyche, IX, p. 293. [♂, ♀ : Beaver Dam, Utah; Ehrenberg and Fort Whipple, Arizona.]  
 1902. *Gryllus rubens* Scudder, *ibid.*, pp. 294, 295. [1 ♀ : Auburn, Alabama.]  
 1902. *Gryllus firmus* Scudder, *ibid.*, pp. 294, 295. [♂, ♀ : Brookville, Indiana; Smithville and Pungo (*nec* Dingo) Bluff, North Carolina; Georgia; Sanford and Key West, Florida.]  
 1903. *Gryllus alogus* Rehn, Proc. Acad. Nat. Sci. Phila., 1902, p. 726. (Jan.) [1 ♀ : Albuquerque, New Mexico.]  
 1903. *Gryllus bermudensis* Caudell, Proc. Ent. Soc. Wash., V, p. 330, (June) [1 ♀, 2 juv. ♂ : Bermuda.]  
 1903. *Gryllus americanus* Blatchley, Orth. Indiana, p. 433. (Sept.) [♂, ♀ : eight counties in Indiana.]  
 1903. *Gryllus arenaceus* Blatchley, *ibid.*, p. 434. [♂, ♀ : sand dune region of Lake County, Indiana.]

Of the names which have been placed under this species by Saussure, we find that *verticalis* of Serville<sup>5</sup> unquestionably belongs under *Miogryllus* and there preoccupies both *laplate* and *saussurei*.

When compared with other distinct exotic species of the genus, this insect is found to differ in the extremes of size, relative proportions, color pattern (where this is developed, this feature being in the present species very frequently lost through intensive coloration and rarely through recessive coloration) and form of the male titillatores.

In *Gryllus domesticus*, *bordigalensis* and *mitratus*, the color pattern

<sup>5</sup> See footnote 13.

is in each wholly different. Other species, such as *Gryllus desertus*, *chinensis*, *afer* and *servillei*, show less striking features, but exhibit a complex of characters which prove them to be distinctive forms, worthy of specific rank. It would be ill advised, however, to attempt detailed diagnoses of the exotic species except in a monographic study of the genus.

*Specific Description.*—Size variable (length ranging from 14 to 28.8 mm.<sup>6</sup>); form robust (two general types are developed, one, particularly found in typical *assimilis*, somewhat more robust and compact than the other, which latter is the normal condition in the great majority of variants developed in the temperate regions). Head slightly broader than pronotum (except in a rare megacephalic condition; in this there is no flattening of the face at the clypeal suture as found in megacephalic males of *Miogryllus*, and to an even greater degree comprehending the entire face in males of several species of the genus *Scapsipedus*<sup>7</sup>). Pronotum with proportionate length of disk somewhat variable, but with this dimension usually contained in the width about 1.4 times, caudal margin of disk straight to distinctly bisinuate, lateral lobes with ventral margin straight and horizontal, or occasionally weakly declivous cephalad, ventrocephalic and ventro-caudal angles rectangulate, the former rather broadly rounded, the latter more decidedly so, the caudal portion of the lateral lobes is somewhat pressed inward, particularly ventrad. In length the tegmina vary from less than half to fully the abdominal length, in some phases their apices are situated extero-laterad, though normally mesad. The wings are either developed as complete organs of flight (though never to the extent found in the

<sup>6</sup> These extremes are nearly equalled in two male specimens before us, both of the *scudderianus* variant and both from Miami, Florida: length of body, 14.5 and 28.5; pronotum, 3.1 and 5.7; caudal femur, 9.1 and 16; tegmen, 9.3 and 17.9; wings, (concealed) and 27; caudal width of pronotum, 4.6 and 8.1 mm.

<sup>7</sup> It is with considerable surprise that we find material of *Scapsipedus limbatus* Saussure (referable to the variety *africanus*, if valid), in material before us from Cuba and Jamaica. The males are easily separable from those of *Gryllus* by the very peculiar head, but the females are instead perfectly normal in this respect; no dark form of *Gryllus* found in America, however, having the transverse yellow markings between the eyes found in the species of *Scapsipedus*. In the present insect the males have a sharply defined band of this color between the ocelli, while the females have an additional band just below, between the ventral margins of the eyes and an elongate triangular mesal spot of the same color below, the apex of which touches this latter band. We mention this species here as females collected at some future time in the West Indies, where the species has almost certainly been accidentally introduced from Africa by man, might easily be confused with *Gryllus*. The genus *Scapsipedus* is African and Oriental, *limbatus* is described from Madagascar, the variety *africanus* by inference from Africa.

species of *Miogryllus*) or are greatly reduced, though perfect and concealed by the tegmina<sup>8</sup> (when greatly reduced in *Miogryllus*, the wings constitute small rounded flattened pads, not folded as in the macropterous condition, and may be termed vestigial rather than reduced). The transverse veins of the male tegmina are normally 3, sometimes 4 (particularly in some South American series where this number is the normal), rarely 5, and very rarely 2 or 6; the speculum is broadly ovate, but somewhat variable in outline, with normally a curved vein dividing it into nearly equal sections. The number of branches of the mediastine vein is variable in the present species and useless as a specific character. The caudal tibiæ have the dorsal margins armed normally with 6 or 7 heavy rigid spines (the number of these spines is seldom 5, except in a very few series and very rarely 8 or more<sup>9</sup>), the distal spurs are 6 in number, the medio-external, medio-internal and dorso-internal being decidedly the longest, of which the medio-internal is normally slightly longer than the others, equalling slightly more than  $\frac{1}{2}$  to  $\frac{3}{5}$  the length of the metatarsus. The male titillatores are very different from those found in either *Gryllus domesticus* or *Gryllus mitratus*, with which species we have alone been able to make this comparison. This organ is found within the subgenital plate of the males of this group and constitutes the repository of a small globular seminal sac which rests upon the subgenital plate, but is enveloped laterad and dorsad by the thin but corneous organ, the parts of which afford the diagnostic features described below. This corneous portion constitutes a thin complex plate, semi-circular in transverse section and composed of a mediodorsal and two lateral parts. The first of these is produced mesad in an upcurved, rather narrow, triangular plate, with margins weakly convex and with length nearly  $1\frac{1}{2}$  times the basal width. The lateral, nearly perpendicular, portions are fused with this portion dorso-proximad and are produced in shorter, narrow, vertical and blunt projections, inside of which from their proximal point of juncture with the dorsal portion extends on each side a single finger-like projection which is also corneous and is slightly curved toward the apices of the lateral projections which it almost reaches. (See Plate IV, figs. 8 and 9.)

The coloration and color pattern is discussed below under the treatment of the varietal developments.

<sup>8</sup> This is carefully discussed and figured by Lutz, The Variation and Correlation of Certain Taxonomic Characters of *Gryllus*, p. 8. (1908.)

<sup>9</sup> In one specimen before us of the *personatus* variant, the dorsal margins of the caudal tibiæ are irregularly armed with 10 and 12 spines.

*Treatment of the Specific Variants.*—In order to place properly the material of this species examined, we have found it quite impossible to group the specimens under any number of varietal units, and in consequence we have devised a system of symbols as given below, by which the coloration, color pattern, tegminal and wing development and size of each specimen recorded at the end of this treatment is defined. We have found that in general certain types do predominate over certain regions. These constitute the bases of many of the supposed species, but in our opinion should be characterized by symbols rather than varietal names, owing to their complexity and the evident fact that none of these are distinct either specifically or as geographic races, and really show only the various phases resultant from varied environmental conditions. In other widely distributed and plastic species we have found similar environmental adaptations,<sup>10</sup> but nowhere in the Orthoptera of America is this carried to the multiplicity and extreme diversity of such variants as in the present species. Should varietal names be used without qualification for such units, even for convenience, the frequent and varied combinations of features, already proven worthless for either specific or geographic racial distinction, would preclude the possibility of proper use of even such names of minor importance for many specimens in every large series studied.

*Symbols used to designate the material of this species here recorded.*

*Coloration of head and pronotum.*

- A. Black.
- B. Black, mouth parts and margins of lateral lobes of pronotum pale.
- C. Very dark brown, paler dorsal postocular bar and marking on infra-ocular portion of genae.
- D. Like C, but with mouth parts also pale and between eyes a pale inverted T-shaped marking.
- E. Pale, with color pattern strongly defined.
- F. Pale, with color pattern weakly defined.

*Coloration of caudal femora.*

- U. Black.
- V. Black, with ventro-proximal portion briefly reddish.
- W. Black, with ventro-proximal portion widely reddish.
- X. Very dark, with reddish suffusion.
- Y. Buffy, suffused with darker distad.
- Z. Buffy.

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<sup>10</sup> *Nemobius fasciatus fasciatus*, *Nemobius fasciatus socius*, *Orchelimum concinnum*, *Conocephalus saltator* and others.

*Coloration of tegmina.*

- a. Unicolorous, dark.
- b. Dark, intermediate channel pale.
- c. Dark, base and intermediate channel pale.
- d. Unicolorous, slightly pale.
- e. Slightly pale, intermediate channel very pale.
- f. Slightly pale, base and intermediate channel very pale.
- g. Unicolorous, very pale.

*Macropterism and brachypterism.*

- u. Tegmina large, wings fully developed organs of flight.
- v. Tegmina large, wings much reduced and concealed by tegmina.
- w. Tegmina slightly reduced, wings as in v.
- x. Tegmina slightly reduced, wings very much reduced.
- y. Tegmina decidedly reduced, wings as in x.
- z. Tegmina greatly reduced, wings as in x.

*Size and form of insect.*

With these numbers 0 signifies exceptionally robust form.

- 1. Size very large.
- 2. Size large.
- 3. Size medium.
- 4. Size small.
- 5. Size very small.

Much material is found not even to fit exactly any series of these symbols. To overcome this difficulty a few qualifying remarks will often be added or two instead of one of a set of symbols given. Thus a specimen recorded as AB, or VX, or 12, shows it to illustrate a condition intermediate between that signified by the two symbols of a single set given.

*The most frequently encountered variants of *Gryllus assimilis*.*

We would again caution the student that these variants are in no case fixed, all manner of intermingling is found in large series and the use of names to designate such is not warranted, as such use would on many occasions unquestionably result in conveying a false impression to subsequent workers.

C, greatly suffused Z, (normally a or b, u) 012. *assimilis* Fabricius.

This variant is widely distributed throughout tropical humid America at low elevations and throughout the West Indies. In the United States it appears only along the coast of extreme southern California. Though many series are quite uniform for this plastic species, specimens before us from Duran, Ecuador, show to varying

degrees the cephalic color pattern found in the species. Other names: *cubensis*, *aztecus*, *galapageius*, *barretti*.

D, suffused Z, (normally d to f, v) 3 (often weakly 0). *mexicanus* Saussure.<sup>11</sup>

This variant is widely distributed over Mexico and Lower California, it is the development toward an arid adaptation of the *assimilis*-type and shows great variability. In the United States occasional individuals show a tendency toward, and a few specimens are typical of, this condition in our series taken along the Mexican border of Texas. In this variant the pronotum has the dorsum frequently narrowly bordered laterad by pale yellowish. Other name: *chichimecus*.

EZ, (normally d to g, u), 2 (often weakly 0). *personatus* Uhler.<sup>12</sup>

This variant, a desert adaptation, in which the extreme of recessive coloration and most strongly defined color pattern is reached, is known only from the United States from Kansas, Colorado and central Texas westward. Of all the variants of the species this one shows the most decided indications of a geographic race in process of evolution. It is interesting to note that this variant averages decidedly heavier than the other desert adaptations of the species found in the southwestern United States. Other name: Stål's much older name, *lineaticeps*, appears to represent a transition between this and the *mexicanus* variant.

A, suffused Z, (normally d to g, u), 3. *armatus* Scudder.

In the same regions of the southwestern United States in which the *personatus* variant is found, the present variant also occurs, often very conspicuous on account of its dark head and pronotum which contrast strongly with the much paler remaining portions of the insect. Great variability is shown in the series before us, many differences being found in individuals of every large series, but none showing any approach to the *personatus* variant. Immature individuals of this variant might be mistaken for those of *Miogryllus lineatus*; they have, however, the abdomen broadly infuscated, giving them a barred appearance, while the spines of the dorsal margins of the caudal femora are rarely less than 6 in number, in *M. lineatus* normally 5, and the young of the same are more uniformly yellowish. Other name: *alogus*.

B, suffused Z, (normally d or e, w) 2 (usually weakly indicated 0). *scudderianus* Saussure.

This variant occurs in sandy areas in the eastern United States,

<sup>11</sup> See Plate IV, Fig. 4.

<sup>12</sup> See Plate IV, Figs. 2, 5, 6, 7.

in the north not large or robust (*scudderianus*, 45), but in Florida larger and more robust (*firmus*, 2 weakly 0). It is an adaptation to arenaceous surroundings in these regions. Immature individuals could easily be confused with those of *Miogryllus verticalis*,<sup>13</sup> but in that species the young are more regularly marked with darker colors and normally have 5 spines on each dorsal margin of the caudal femora. Other names: *rubens*, *firmus*, *arenaceus*.

AU, (normally ax) 4. *neglectus* Scudder.

This is the darkest variant found in the present species, the maximum development of the condition found also in the two following variants. It is found in the northeastern portion of the insect's distribution, ranging southward in the high Appalachians to northern Georgia and is known from the Piedmont Plateau only in Pennsylvania. Much variability exists and every intergradation with the next two variants is often to be found in the same series.

AV, (normally a or b but ranging to f, x but often u), 3. *pennsylvanicus* Burmeister.

This is the dominant variant of the species in the well watered regions of temperate North America and is found southward to the Gulf coast of eastern Texas. Great variability is exhibited and every intergradation with the variants termed *neglectus* and *luctuosus* is to be found. Other names: *nigra*, *angustus*.

AW, (normally d but ranging from a to f, w but often u), 3. *luctuosus* Serville.<sup>14</sup>

This variant shows an intensification of the features of the last. It is found throughout the lowlands of the southeastern United States and in the Middle West from Manitoba southward to the arid regions. It also exhibits great variability. The maximum of this condition is found in material from the pine woods of the southeastern United States. Other names: *abbreviatus*.

AXW, (normally a, u but often w), 3. *integer* Scudder.

This is an adaptation found in the mountains of the arid portions of the southwestern United States and also in California. Extreme variability is to be found. Other name: *vocalis*.

Our series are not sufficiently numerous from temperate South America to show as definitely the variants there developed; quite as many probably exist as found in North America. Of these *fulvi-*

<sup>13</sup> Under this name of Serville's will be found both *laplatae* Saussure and *saussurei* Scudder. See Hebard, Jour. N. Y. Ent. Soc., XXIII. (1915.)

<sup>14</sup> This is the variant which the authors have previously consistently recorded as *rubens* from the southeastern United States.

*pennis* appears to be an adaptation similar to the *pennsylvanicus* variant, but heavier, though no more compact, with larger head; under *argentinus* appear to be described numerous adaptations, though typically suggesting the *luctuosus* variant with tegmina f. Saussure's *argentinus* variety *c* is, however, an adaptation similar to the *personatus* variant, but with color pattern scarcely developed.

We have not referred to Walker's names here, as the majority have already been proven synonyms and the descriptions are worthless.

We feel certain that the other described South American species have no further significance than the North American variants discussed above. We have noted that in the mountains, particularly those of arid or semi-arid regions, a degree of plasticity is found greater even than exhibited elsewhere by this most plastic species. Several South American names are doubtless applicable to such manifestations of the species.

Females, as a rule, have the tegminal and femoral markings more decided than in the male sex, thus frequently in the same series the males will show VWa, while the females will average Wb.

As in our other recent papers, the material collected by one or both of the authors is understood to be in The Academy of Natural Sciences of Philadelphia or Hebard Collection.

*Specimens Examined.*—1504; 570 males, 857 females, 41 immature males and 36 immature females.

#### *Rhode Island.*

Providence, IX, 28, 1896, 1 ♀, (AXgx 2), [A. N. S. P.].

Wesquage Beach, IX, 8 to 10, 1913, (H; upland fields), 2 ♀, (AVgx 2; AVgw 2).

#### *Connecticut.*

New Haven, VI, 1, 1910, (H.), 1 ♂, 1 ♀,<sup>15</sup> (♂ AVaw 4; ♀ AVgy 4), X, 1909, (H.), 1 ♀, (AVey 2).

#### *New York.*

Peekskill, IX, 16, 1912, (E. G. Vanatta), 3 ♀, (AVbx 2), [A. N. S. P.].

#### *Pennsylvania.*

South Sterling, IX, 14, 1906, (B. Long), 1 ♂, (AUaw 4), [A. N. S. P.].

Tobytown, IX, 1, 1903, (H.), 1 ♂, 1 ♀, (♂ AUaw 3; ♀ AUVay 3).

Lehigh Gap, VII, 12, 1897, 1 ♂, (AUXdw 3), [A. N. S. P.].

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<sup>15</sup> Recorded by Hebard as *Gryllus neglectus*.

- Ganoga Lake, IX, 2, 1900, 1 ♂, 1 ♀, (♂AUax 3; ♀ AUbx 3), [A. N. S. P.].
- Harrisburg, V, 27, 1 ♀, (AVey 2); IX, 27 to XI, 5, 1 ♂, 9 ♀, 1 juv. ♂, 1 juv. ♀, (♂ AVaw 3; 1 ♀ AVby 4; 2 ♀ AVfy 2; 6 ♀ AVey 3), [all Pa. State Dept. Zool.].
- Camphill, IX, 12 and X, 19, 2 ♀, (AVbx 2), [Pa. State Dept. Zool.].
- State College, IX, 6, 1 ♂ (head nearly black, pronotum, tegmina and caudal femora dark brown, w 3), [Pa. State Dept. Zool.].
- Orrtanna, IX, 4, 1 ♀, (AUVbw 2), [Pa. State Dept. Zool.].
- Philadelphia, VI, 29 to VII, 8, 1897 and 1898, 2 ♂, 1 ♀, (♂ AVdw 2; ♀ AVau 2), [A. N. S. P.].
- Cornwells, IX, 7, 1914, (H.), IX, 11, 1906, (R. & H.), 3 ♂, 7 ♀, (1 ♂ AVfw 2; 2 ♂ AVdw 3; ♀ AV to W, e to g, w to z, 2 to 3).
- Chestnut Hill, VIII, 7 to IX, 20, 1903 to 1911, (H.), 3 ♂, 4 ♀, (♂ AUaw 6; ♀ AU, a to b, x to y, 3 to 4).
- Mount Airy, IX, 12, 1903, (H.), 1 ♀, (AVfx 2).
- Pink Hill, Newtown Square, VI, 19 to VII, 1, 1906 to 1910, (R. & H.; serpentine barrens), 1 ♂, 6 ♀, (♂ AVau 2, ♀ AV, a, b and e, u w and x, 3 to 4).
- Newtown Square, VI, 29, 1911, (H. Fox), 1 ♂, (AVdw 3), [A. N. S. P.].
- Castle Rock, (G. M. Greene), 1 ♂, (AUax 3), [A. N. S. P.].
- Berwyn, IX, 9, 1 ♀, (AUbx 2), [Pa. State Dept. Zool.].
- Fern Hill, Chester County, VI, 11, 1911, (R. & H.; serpentine barrens), 1 ♀, (AVew 3); IX, 19, 1908, (R. & H.; serpentine barrens), 1 ♂, 1 ♀, (♂ AUaw 3, ♀ AUby 3).
- Addingham, VIII, 13, 1914, (D. Culver), 1 ♀, (AUbx 2), [A. N. S. P.].
- Tinicum Island, IX, 9 and 29, 1903 and 1904, (R. & H.; marsh land) 7 ♂, 6 ♀, (♂ A, V and X, dw, 3 to 4; 5 ♀ A, V and W, ex, 3 to 4; 1 ♀ weakly B, WGw 2).
- Port Allegany, VIII, 1 to 8, 1904, (H. W. Fowler), 1 ♂, 1 ♀ (AVaw 4), [A. N. S. P.].
- Diamond Valley, Huntingdon County, IX, 10, 1905, (R.), 1 ♂, 4 ♀, (♂ AVaw 3; ♀ A, U to V, by 3).
- McConnellsburg, VI, 4, 1905, 1 ♂, (AVfu 2), [A. N. S. P.].
- Meadville, XI, 11, 1 ♀, (AVbw 3), [Pa. State Dept. Zool.].
- Beaver, VIII, 1, 3 ♀, (AVfx 3), [Pa. State Dept. Zool.].
- Beatty, (O. Brugger), 2 ♀, (Ab, u and x, 3), [A. N. S. P.].

#### *New Jersey.*

- Riverton, IX, 8, 1901, (H. L. Viereck), 1 ♂, (AVgx 3); IX, 11, 1904, (G. M. Greene), 3 ♀, (AWf, u and x, 2), [all A. N. S. P.].
- Westville, IX, 25, 1901, (G. M. Greene), 1 ♀, (AVbu 2); X, 19, 1897, 1 ♂, (AWdw 2), [all A. N. S. P.].
- Clementon, X, 15, 1907, 1 ♂, (AVfx 2), [A. N. S. P.].
- Sumner, IX, 15, 1906, (B. Long), 1 ♂, 1 ♀, (♂ weakly B, Wgw 3; ♀ AVex 3), [A. N. S. P.].

Atsion, X, 8, 1903, (H.; pine barrens), 1 ♂, 3 ♀,<sup>16</sup> (♂ 1 ♀ weakly B, paler X, gw 2; 2 ♀ AVbw 2).

Centre of East Plains, Ocean County, VIII, 24, 1914, (H.; ground oak and pine), 1 juv. ♂, (BY).

Staffords Forge, VIII, 29 and IX, 16, 1905 and 1907, (R. and R. & H.; pine barrens), 5 ♂, 4 ♀, (4 ♂, 3 ♀ A, V to W, d to f, w to y, 2 to 3; 1 ♂ 1 ♀ AYgw 3).

Spray Beach, Long Beach Island, VII, 18 and IX, 6, 1906 and 1907, (B. Long), 1 ♂, 1 ♀, (♂ BYgx 4; ♀ AVfx 4), [A. N. S. P.].

Chairville, VI, 17, 1901, (R.), 1 ♀, (AVex 3).

Ventnor, VIII, 26, 1914, (H.), 1 ♂, 1 ♀, (AV, d and a, w 3).

Formosa Bog, Cape May County, IX, 1, 1908, (H. Fox), 1 ♀, (AVbx 3), [A. N. S. P.].

Townsend's Inlet, Sea Isle City, IX, 8, 1908, (H. Fox; grassy field), 1 ♀, (BYgx 2), [A. N. S. P.].

Sea Isle City, VI, 14, 1912, (H. Fox; washed up), 1 ♂, 1 ♀, (♂ AVcu 2, ♀ AWeu 02), [A. N. S. P.].

Swainton, VII, 20 to 27, 1914, (H.; trapped, molasses jar), 1 juv. ♂, (BY).

Dias Creek, VII, 27, 1914, (H.; trapped, molasses jar), 1 juv. ♂, (BY).

#### *Maryland.*

Chestertown, VIII, 20 and 26, 1899, (E. G. Vanatta), 1 ♂, 1 ♀, (♂ wholly pale brown, w 3; ♀ AVby 2), [A. N. S. P.].

Jennings, VI, 24, 1907, (B. Long), 1 ♂, 1 ♀, (AUaw 3, AVbx 3), [A. N. S. P.].

Washington, District of Columbia, VI, 25, 1 ♂, (AVau 3) [A. N. S. P.]; IX, 1883, 1 ♂, (AVaw 2), [Hebard Cln.].

#### *Virginia.*

Roslyn, X, 22, 1900, (R.), 1 ♀, (AUVby 3).

#### *North Carolina.*

Edenton, VIII, 20, 1908, (R.; moist land), 1 ♂,<sup>17</sup> (Ydw 3).

Newbern, VIII, 24, 1908, (R.), 1 ♀<sup>18</sup>, (AVWeu 3).

Raleigh, IV, 16 to IX, 13, 1904, (C. S. Brimley), 9 ♂, 14 ♀,<sup>19</sup> (7 ♂ AWhw, 3 to 4; 1 ♂ AWaw 3; 1 ♂ AVgy 3; ♀ AW, g and e, x and y, 3 to 4), [Hebard Cln.].

Sulphur Springs, near Asheville, V, 10 to VI, 13, 1904, (H.), 7 ♂, 3 ♀,<sup>20</sup> (6 ♂ AVaw 3; 1 ♂ AVfx 3; ♀ AVbw 3).

<sup>16</sup> Recorded as *Gryllus luctuosus* by Rehn.

<sup>17</sup> Recorded by the authors as *Gryllus rubens*.

<sup>18</sup> *Ibid.*

<sup>19</sup> *Ibid.*

<sup>20</sup> One male recorded by the authors as *Gryllus rubens*, the others as *Gryllus pennsylvanicus*.

Mount Pisgah, 4500 feet, X, 1, 1904, (H.; summit bald), 2 ♂, 2 ♀,<sup>21</sup> (♂ AUax 4; ♀ AVby 3).

Winter Park, IX, 7, 1911, (R. & H.; moist undergrowth of longleaf pine woods), 2 ♂, 4 ♀, (♂ AVaw 1; ♀ AVb, w and u, 1).

Lake Waccamaw, IX, 8, 1911, (R. & H.), 6 ♂, 4 ♀, (AW, ♂ a ♀ b, u and w, 3 and 4).

*South Carolina.*

Florence, IX, 6, 1911, (R. & H.), 2 ♀, (AYfw 3; AWeu 2).

Sullivan Island, Charleston County, IX, 5, 1911, (R. & H.; on sandy soil), 2 ♀, (BYe, w and x, 2).

Yemassee, IX, 4, 1911, (R. & H.), 1 juv. ♀, (EZ 2).

*Georgia.*

Rabun Bald, Rabun County, 4000 to 4600 feet, VIII, 21, 1913, (J. C. Bradley), 1 ♂, (AU), [Ga. State Cln.].

Black Rock Mountain, Rabun County, 3000 feet, V, 20 to 25, 1911, (W. T. Davis), 1 ♂, (AVaw 3), [Davis Cln.].

Tuckoluge Creek, Rabun County, VII, 1910, (W. T. Davis), 1 ♀, (AVWbx 3), [Davis Cln.].

Clayton, 2000 feet, V, 18 to VI, 1909 and 1911, (W. T. Davis: J. C. Bradley), 2 ♂, 4 ♀, (♂ A, V and W, a and d, y 7; 1 ♀ AUau 03; 1 ♀ AVax 3; 1 ♀ AVbx 3; 1 ♀ AEbz 4), [Davis Cln. and Ga. State Cln.].

Atlanta, VII, 10 to VIII, 30, 1910 and 1913, (J. C. Bradley: R. & H.; in pine woods), 1 ♂, 3 ♀, (♂ 2 ♀ AW, d and e, u and w, 2; 1 ♀ AEgw 3).

Vicinity of Stone Mountain, VIII, 3, 1913, (R. & H.; pine woods on edge of bog), 1 ♀, (AWaw 3).

Augusta, VII, 29, 1913, (R. & H.; untilled field among grasses), 4 ♂, (A, WX and Z, dw 3).

Jesup, IX, 1, 1911, (R. & H.), 1 ♀, (AWv 3).

Waycross, V, 10, 1911, 1 ♀, (AVbu 2), [Ga. State Cln.].

Hebardville, VIII, 28, 1911, (H.), 1 ♂, (AWdw 2).

Billy's Island, Okefenokee Swamp, VI to IX, 5, 1912 and 1913, (J. C. Bradley), 1 ♂, 5 ♀, (1 ♂ 1 ♀ AWdw 2; 1 ♀ mouth parts pale, Wau 2; 3 ♀ B, Y and Z, f and d, w 3), [Cornell Univ.].

St. Simon's Island, VIII, 30, 1911, (R. & H.; in live oak forest very common in areas of *Helianthemum carolinianum*), 23 ♂, 23 ♀, 1 juv. ♂, (AW, a but ♀ occasionally b, z, 2 to 4; 1 ♀ BZgv 3); IX, 4, 1909, (J. C. Bradley), 2 ♂, 1 ♀, (♂ AVfv 1; ♀ BZdv1), [Ga. State Cln.].

Cumberland Island, VIII, 31, 1911, (R. & H.), 2 ♀, (A, V and W, b and d, u 3).

Fargo, VIII, 31, 1913, (J. C. Bradley), 1 ♀, 1 juv. ♂, (♀ BYdv 3), [Cornell Univ.].

Chester, IX, 7, 1904, 1 ♂, (AWau 3), [Ga. State Cln.].

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<sup>21</sup> Recorded by the authors as *Gryllus neglectus*.

Thomasville, III, 18 to XI, 30, 1903 and 1904, (H.: for H.), 20 ♂, 17 ♀,<sup>22</sup> (♂ AW, a or d, u v and x, a to g, u to z, 2 to 4 averaging 6; ♀ A to B, W Y and Z, a to g, u to z, 2 to 4).

Bainbridge, IX, 17 to X, 19, 1910, (J. C. Bradley), 1 ♂, (AWau 3), Ga. State Cln.].

Spring Creek, Decatur County, VII, 16 to 28, 1912, (J. C. Bradley), 1 ♂, 2 juv. ♀, (♂ AWav 3; juv. BZ), [Ga. State Cln.].

#### *Florida.*

Jacksonville, VIII, 10 and 25, 1905 and 1911, (R. & H.), 1 ♂,<sup>23</sup> 2 ♀, (♂ AWdu 2; 1 ♀ AWbu 2; 1 ♀ BYdv 3).

Atlantic Beach, VIII, 24, 1911, (R. & H.), 1 ♂, 4 ♀, 1 juv. ♀, (1 ♂ 1 ♀ A, reddish Ydw 3, 3 ♀ AWYdw 3; juv. BZ with dorsal postocular bar also).

Pablo Beach, IX, 5 and 27, 1913, (W. T. Davis) 3 ♂, 3 ♀, (A to B, V to suffused Z, d to weakly f, v, 12 to 3), [Davis Cln.].

Burnetts Lake, XI, 19, 1911, (W. T. Davis), 2 ♀, (A to AB, W, a and d, u and v, 2 and 23), [Davis Cln.].

Gainesville, VIII, 16 and 17, 1905, (R. & H.; pine woods) 2 ♂,<sup>24</sup> 1 juv. ♂, (♂ A and AB, W and WY, d and df, u and w, 3; juv. EFZ).

Live Oak, VIII, 26, 1911, (R. & H.), 1 ♂, 2 ♀, (A, reddish Y and Z, d and f, w and u 3).

Lakeland, XI, 8 to 17, 1911, (W. T. Davis), 3 ♂, 3 ♀,<sup>25</sup> (♂ A, W Y and Z, a and d, u and v, 23 and 4; ♀ A and B, W and Y, b and f, u and v, 2 and 3), [A. N. S. P. and Hebard Cln.].

Tampa, I, 16, 1904, (H.), 1 ♂, 1 ♀,<sup>26</sup> (AWdv 3).

Braidentown, 1 ♀, (B but head black, Zgv 3), [A. N. S. P.].

Punta Gorda, XI, 13 to 16, 1911, (W. T. Davis), 1 ♂, 4 ♀,<sup>27</sup> (♂ AXdv 1; 1 ♀ AXby 1; 3 ♀ BZgv, 1 to 3), [A. N. S. P. and Hebard Cln.].

Chokoloskee, IV and V, 1903, 2 ♂, 1 ♀,<sup>28</sup> (AWdu 3), [Hebard Cln.].

Everglade, V, 1912, (W. T. Davis), 1 ♀,<sup>29</sup> (BZew 1), [Hebard Cln.].

South Bay, Lake Okeechobee, IV, 30, 1912, (W. T. Davis), 1 ♀,<sup>30</sup> (AWau 3), [A. N. S. P.].

Miami, II, 6 to VIII, 21, 1904 to 1910, (H.: for H.), 11 ♂, 11 ♀, 3 juv. ♂,<sup>31</sup> (♂ A, W to Z, a and d, u to x, 1 to 5; ♀ A to B, W to Z, b to g, u to x, 2 to 3),<sup>32</sup>

<sup>22</sup> The majority recorded by the authors as *Gryllus rubens*, the others as *Gryllus pennsylvanicus* and *luctuosus*.

<sup>23</sup> Recorded by the authors as *Gryllus rubens*.

<sup>24</sup> *Ibid.*

<sup>25</sup> Recorded as *Gryllus firmus* and *rubens* by the authors.

<sup>26</sup> Recorded as *Gryllus rubens* by the authors.

<sup>27</sup> Recorded by the authors as *Gryllus firmus*.

<sup>28</sup> Recorded by the authors as *Gryllus rubens*.

<sup>29</sup> Recorded by the authors as *Gryllus firmus*.

<sup>30</sup> Recorded as *Gryllus rubens* by the authors.

<sup>31</sup> Recorded as *Gryllus firmus* and *rubens* by the authors.

<sup>32</sup> The extremes of this series show, even for this plastic species, unusual contrast.

Homestead, III, 17 to 19, 1910, (H.) 2 juv. ♂, 1 juv. ♀; VII, 10 to 12, 1912, (R. & H.), 2 ♂<sup>33</sup> (1 AWdu 3; 1 AZgu 2).

Detroit, VII, 12, 1912, (R. & H.), 1 ♀<sup>34</sup> (BZew 2).

Jewfish, VII, 11, 1912, (H.; in cracks of sun-baked marsh soil), 2 ♂, 1 ♀<sup>35</sup> (♂ AZd, u and w, 2 and 3; ♀ BZdw 2).

Long Key, III, 13, 1910, (H.), 1 juv. ♂<sup>36</sup> (B with dorsal post-ocular bar, Z).

Key West, III, 15 and 16, 1910, VII, 3 to 7, 1912, (H.: R. & H.), 4 ♂, 3 ♀, 2 juv. ♀<sup>37</sup> (BZ, d to g, w, 3 to 2).

#### *Indiana.*

Crawford County, V, 26, 1902, IX, 9, 1903, (W. S. Blatchley), 1 ♂, 1 ♀, (AWd, w and x, 3 and 4), [Colo. St. Agr. Exp. Sta.]; V, 27, 1904, 1 ♂, (AUax 4), VI, 20, 1902, (both W. S. Blatchley), 1 ♀, cotype of *Gryllus americanus* Blatchley, (AVax 3), [both A. N. S. P.].

Posey County, V, 12, 1903, (W. S. Blatchley), 1 ♀, (AUay 34), [Colo. St. Agr. Exp. Sta.].

#### *Michigan.*

Pequaming, VII, 22 to IX, 1, 1903, (H.), 35 ♂, 21 ♀<sup>38</sup> (2 ♂ AUaw 4; 1 ♂ AUbw 4: others, ♂ AV, a or d, w 4; ♀ AVb, w to y, 4).

Gun Lake, VII, 13 to 26, 1912, (M. A. Carricker, Jr.), 1 ♀, 2 juv. ♂, 1 juv. ♀, (♀ AZgx 4), [Hebard Cln.].

#### *Illinois.*

Chicago, IX, 9, 1903, (H.; in waste field), 2 ♂, 2 ♀, (♂ AVaw 4; ♀ AVex 4).

Moline, VI, 11, to X, 15, (J. T. McNeill), 1 ♂, 2 ♀, (♂ AVaw 3; 1 ♀ AVbw 2; 1 ♀ Aeu 3), [Hebard Cln.].

Dubois, VI, 21, 1905, (C. A. Hart), 1 ♀, (AUay 3), [Colo. St. Agr. Exp. Sta.].

#### *Missouri.*

St. Louis, VIII, 27, 1904, (H.; in waste field), 1 ♀<sup>39</sup> (AVax 2); X, 22, 1905, (C. L. Heink), 1 ♀, (AWew 2), [Hebard Cln.].

#### *Tennessee.*

Nashville, 1 ♀, (AVWdw 2), [Hebard Cln.].

<sup>33</sup> Recorded as *Gryllus rubens* and *firmus* by the authors.

<sup>34</sup> Recorded by the authors as *Gryllus firmus*.

<sup>35</sup> *Ibid.*

<sup>36</sup> *Ibid.*

<sup>37</sup> *Ibid.*

<sup>38</sup> Recorded by Rehn as *Gryllus pennsylvanicus*.

<sup>39</sup> Recorded as *Gryllus pennsylvanicus* by the authors.

*Mississippi.*

Agricultural College, V, 1893, (H. E. Weed), 1 ♂, (A but margins of pronotum pale, Ygw 3), [Hebard Cln.].

Wiggins, IV, 18, (F. M. Jones), 1 ♂, 2 ♀, 2 juv. ♂, 1 juv. ♀, (1 ♂, 1 ♀ AYgw 3; 1 ♀ AWeu 3), [A. N. S. P.].

Biloxi, III, 2 to IV, 24, (F. M. Jones), 2 ♂, 4 ♀, (1 ♂ AWby 3; 1 ♂ AWdw 4; 1 ♀ AYdw 3; 1 ♀ AWew 3; 2 ♀ AZgw 2), [A. N. S. P.].

*Manitoba.*

Aweme, VI, 21 and IX, 12 to 23, 1909, (N. Criddle), 8 ♂, 4 ♀,<sup>40</sup> (♂ A, UV to VW, a, w to x, 4; ♀ A, UV to strong W, a and b, x and y, 4), [Hebard Cln.].

*Nebraska.*

West Point, V, 4 to IX, 1, (L. Bruner), 11 ♂, 7 ♀, (♂ AVa, v and w, 2 to 4, majority 3; 5 ♀ AV, a and b, w x and y, 2 to 3; 2 ♀ AWgy 3), [Hebard Cln.].

South Bend, V, 1 ♂, 1 ♀, (A, UV, a and b, w and x, 3); VIII, 11, 1910, (L. Bruner), 1 ♀, (AWbw 3), [all Hebard Cln.].

Lincoln, V to IX, mainly 1893, (L. Bruner), 24 ♂, 14 ♀, 1 juv. ♂, (♂ AV, a and d, v and w, 2 to 3; ♀ A, V to VW, a to d, u v to y, 2 to 3), [Hebard Cln.].

Valentine, 1 ♂, (AVay 4), [Hebard Cln.].

Dismal River, VII, 1 ♀, (AWXbu 3), [Hebard Cln.].

Nebraska City, VI, 1 ♂, 1 ♀, (AUVA, w and x, 3 and 4), [Hebard Cln.].

Broken Bow, VII, 4, 1889, 1 ♂, 1 ♀, (♂ AUVaw 3; ♀ AVbu 3), [Hebard Cln.].

Sioux City, V, 1 ♂, (AWdy 3), [Hebard Cln.].

Squaw Cañon, Sioux County, VII, 1892, 1 ♂, 6 ♀, (♂ AVXaz 3; ♀ A, V to W and to X, ab 3), [Hebard Cln.].

War Bonnet Cañon, Sioux County, 1 ♂, 2 ♀, (♂ AVdw 4; ♀ AV, a and e, y 4), [Hebard Cln.].

*Iowa.*

Iowa City, VIII, 1889, (B. Shimek), 1 ♀, (AWey 2), [Hebard Cln.].

*Kansas.*

Topeka, (F. W. Cragin), 3 ♂, 1 ♀, (A, W and V, a and b, w and x, 3 and 2), [Hebard Cln.].

Barber County, (F. W. Cragin), 1 ♂, 1 juv. ♀, (♂ AWaw 3; juv. D, darkened Z, 2), [Hebard Cln.].

Dodge City, IX, 13, 1909, (H.; grass prairie), 3 ♂, 1 ♀, (♂ A, V to W, ax, 2 to 3; ♀ A with ventral portion of face with pale markings, strongly W, ew 2).

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<sup>40</sup> In part recorded as *Gryllus pennsylvanicus* form *neglectus* by the authors.

Garden City, (F. W. Cragin), 1 ♀, (AYgw 3), [Hebard Cln.].  
 Syracuse, 3230 feet, IX, 12, 1909, (R. & H.; grass prairie), 1 ♀, (AWaby 2).

*Wyoming.*

Pine Bluff, 1 ♂, 4 ♀, (A, V to strongly W, a, w to y, 4 and 5), [Hebard Cln.].

Worland, VII; (L. Bruner), 1 ♀, (AVbx 2), [Hebard Cln.].  
 Sheridan, VII, 27, 1909, (R.; hills with scant grass), 1 ♂, 5 ♀, (♂ AVaw 3; ♀ A, V to W, d to f, xy, 3 to 4).  
 Mammoth Hot Springs, Yellowstone National Park, VIII, 5. 1904, (H.; in hot spring), 1 ♀,<sup>41</sup> (AWfy 4).

*Idaho.*

Pocatello, 1 ♀, (AUdu 3), [Hebard Cln.].  
 Cœur d'Alene, VII, 31, 1889, 1 ♀, (A, reddish Z, dx 3), [Hebard Cln.].

*Colorado.*

Julesburg, 3460 feet, VII, 29, 1910, (R. & H.), 1 ♀, (AUvaw 3); VIII, 4, 1899, 1 ♂, (AVaw 3), [Colo. St. Agr. Exp. Sta.].

Merino, VIII, 6, 1902, 2 ♀, (AWby 34), [Colo. St. Agr. Exp. Sta.].  
 Akron, VII, 1891, 2 ♀, (AVW, b and f, u 3), [Hebard Cln.].  
 Brush, VIII, 24, 1904, (H.; weeds on prairie), 1 ♀,<sup>42</sup> (AWabz 3).  
 Greeley, IX, 4, 1902, 1 ♀, (AWbx 2), [Colo. St. Agr. Exp. Sta.].  
 Fort Collins, VI, 10 to X, 6, 1898 to 1903, 9 ♂, 4 ♀, (A, very strongly W to WV, a b d and e, w to y, 2 to 34), [Colo. St. Agr. Exp. Sta.].

Boulder, VIII, 1908, (G. von Krockow), 1 ♂, (AVaw 2), [A. M. N. H.]; X, 29, 1904, (T. D. A. Cockerell), 1 ♀, (AWabz 3), [A. N. S. P.].

Denver, III, 21, (Beale), 1 ♂, 1 ♀, (♂ AUvaw 2; ♀ EZe 23); 1 ♀, (AWeu 3), [all Hebard Cln.].

Colorado Springs, 1 ♂, 2 ♀, (A, V and UV, a, w and y, 23 to 4), [Hebard Cln.].

Holly, IX, 8, 1898, 1 ♀, (AWaw 2), [Colo. St. Agr. Exp. Sta.].  
 Lamar, IX, 10, 1898, 1 ♀, (AWaw 2), [Colo. St. Agr. Exp. Sta.].  
 La Junta, VII, 16, 1901, 3 ♀, (EZfu 5), [Colo. St. Agr. Exp. Sta.]; 4045 feet, IX, 11, 1909, (R. & H.; at light), 2 ♂, 2 ♀, (1 ♂ AVdu 2; 1 ♂ A, reddish Z, gu 3; ♀ AVau 2).

Pueblo, IX, 25, 1901, 1 ♀, (AWax 2), [Colo. St. Agr. Exp. Sta.].  
 Antonito, VIII, 6, 1899, 1 ♀, (AVWex 4), [Colo. St. Agr. Exp. Sta.].

Grand Junction, V, 25, 1900, 1 ♀, (AVgu 34), [Colo. St. Agr. Exp. Sta.].

<sup>41</sup> Recorded as *Gryllus pennsylvanicus* by the authors.

<sup>42</sup> *Ibid.*

*Texas.*

Galveston, VII, 19 to 21, 1912, (H.), 1 ♂, 2 ♀, (♂ AWaw 3; ♀ AB and B, Y and Z, e and g, w, 2 and 23).

Virginia Point, VII, 21, 1912, (H.; under boards in tall salt marsh grasses), 1 ♂, 1 ♀, (♂ AWax 2; ♀ A but mouth parts pale, bx 2).

Dickinson, VII, 20, 1912, (H.; undergrowth of pine woods), 1 ♂, (dark B, dark Y, dw 3).

Rosenberg, VII, 25 and 26, 1912, (H.), 1 ♂, 1 ♀, (♂ AUaw 2; ♀ B, suffused Z, ew 2).

College Station, VIII, 22, 1903, 1 ♀, (A, suffused Z, eu, 1), [Hebard Cln.].

Washington County, IV, 1 ♀, (AWdz 6), [Hebard Cln.].

Victoria, VII, 26 and 27, 1912, (H.), 1 ♀, (AVbu 2).

Beeville, VII, 28, 1912, (H.), 1 ♀, (AVWeu 3).

Corpus Christi, VII, 29, 1912, (H.), 1 ♂, (AVau 3).

Brownsville, VII, 31 to VIII, 5, 1912, (H.; at light), 4 ♂, 6 ♀, (1 ♂ A, suffused Z, au 2; 1 ♂ AVdu 2; 1 ♂ A, suffused W, du 3; 1 ♂ EZgu 2; 3 ♀ weakly B, strongly suffused Z, bu 2; 2 ♀ AUbu, 3 and 34; 1 ♀ EZeu 2).

Shovel Mountain, Burnet County, IX, 5 and X, 4, 1901, (F. G. Schaupp), 3 ♂, 4 ♀, (A to weakly B, strongly suffused Z, d and e, u, 2 to 23); XII, 20, 1901, (F. G. Schaupp), 1 ♀, (AWax 4), [all A. N. S. P.].

Tiger Mills, (F. G. Schaupp), 1 ♀, (AXVay 34), [Hebard Cln.].

San Antonio, IV to VI, 1885, (M. Newell), 1 ♂, 9 ♀, 3 juv. ♂, (♂ AWXaw 3; 3 ♀ A, V to suffused W, b, u and v, 2; 1 ♀ weakly B, reddish Y, eu 2; 5 ♀ A, W to WX, a, y and z, 4), [Hebard Cln.].

Carrizo Springs, V and X, 1 to 25, 1885, (A. Wadgymar), 6 ♂, 7 ♀, 3 juv. ♂, 3 juv. ♀, (1 ♂ A but lateral lobes of pronotum pale, heavily suffused Z, du 2; 1 ♂ A, heavily suffused Z, du 3; 4 ♂ A, V to W, y 4; ♀ B, reddish Z, e, u and x to y, 3 to 2; 1 juv. ♂, 2 juv. ♀, AV; 2 juv. ♂, 1 juv. ♀, BY), [Hebard Cln.].

Laredo, VIII, 10 to 12, 1912, (R. & H.); 1 ♀, (EZfu 2).

Del Rio, VIII, 22 to 23, 1912, (R. & H.; at light), 5 ♂, 16 ♀, (2 ♂, 3 ♀ EZfu 2; 3 ♂ 13 ♀ A with pronotum with lateral lobes occasionally slightly margined with pale, V to much suffused reddish Z, a b d e and g, u, 23 to 34).

Mission, VIII, 26 and 27, 1912, (R. & H.), 2 ♀, (1 ♀ D, suffused Y, du 3; 1 ♀ E, little suffused Z, cu 2).

Hackberry Creek, Brewster County, IX, 2, 1912, (R. & H.), 1 ♂, (AUXax 3).

Dog Cañon, Brewster County, IX, 3, 1912, (R. & H.), 1 ♂, (DE, suffused Z, dw 3).

Moss Well, Chisos Mountains, 4500 feet, IX, 5 to 8, 1912, (R. & H.; occasional in grasses, 2 at light, song a quick, short chirping), 1 ♂, 2 ♀, (AVXa, x and y, 3).

Cañon behind Pulliam Bluff, Chisos Mountains, 4600 to 5000 feet, IX, 7, 1912, (R. & H.), 2 ♂, (AUXaw 3).

Franklin Mountains near El Paso, VII, 11, 1907, (R. & H.); arid mesa slopes among stones), 1 ♂, 1 ♀, 2 juv. ♀, (♂ AVXow 3; ♀ B, suffused reddish Z, by 23; juv. Z, 2 and 3); VIII, 20, 1905, (R. & H.), 3 ♀, (1 ♀ AWdu 3; 1 ♀ B, suffused reddish Z, du 3; 1 ♀ EZeu 2); IX, 16, 1912, (H.; at base, light at night), 8 ♂, 10 ♀, 1 juv. ♂, (♂ A, suffused W to suffused Z, a and d, u, 3 to 34; 8 ♀ A, UV to strongly W and suffused reddish Z, a and d, u, 23 to 3; 2 ♀ EZfu, 3 and 23; juv. EZ with barred abdomen).

El Paso, IX, 16, 1912, (R. & H.; river bottom lands), 2 ♂, (1 ♂ A, much suffused reddish Z, du 23; 1 ♂ weak B, WZgu 3).

#### New Mexico.

Gallinas Cañon, San Miguel County, (E. J. Oslar), 1 ♂, 1 ♀,<sup>43</sup> (AVa, x and y, 4 and 34), [A. N. S. P.].

Roswell, VIII, 1902, (T. D. A. Cockerell; at light), 1 ♂, (AVdu 23), [A. N. S. P.].

Jemez Hot Springs, 6400 feet, V, 17 to VIII, 13, 1913, (J. Woodgate), 3 ♂, 9 ♀, (♂ A, UV to V, ax 4; ♀ A, U to VW, a but 1 e, y to yz, 34 to 4), [Hebard Cln.].

Albuquerque, 1888, (F. H. Wickham), 1 ♂, 2 ♀, (♂ AXd, y for this sex, 3; 1 ♀ AWby 3; 1 ♀ AWgz 34), [Hebard Cln.]; 1902, (T. D. A. Cockerell), 1 ♀, type of *Gryllus alogus* Rehn, (C but pronotum all black, reddish Y, ex 3), [A. N. S. P.].

Fort Wingate, III, 27 to VIII, 14, 1908 and 1910, (J. Woodgate), 6 ♂, 12 ♀, 1 juv. ♂, 2 juv. ♀, (4 ♂ A, U to V, a and d, x, 23 to 3; 1 ♂ A, strongly W, d, z for this sex, 4; 1 ♂ A but mouth parts pale, reddish Z, d, z for this sex, 4; ♀ A but mouth parts pale in 2 small pale specimens, V and W and X to reddish Z, X to extreme Z, 2 to extreme 5; juv. A, V and greatly suffused Z),<sup>44</sup> [Hebard Cln.].

Cloudcroft, 8600 feet, VII, 15, 1907, (H.; under stone, stridulating at night), 1 ♂,<sup>45</sup> (AVax 4).

Highrolls, 7000 feet, V, 31 to VI, 13, 1902, (H. L. Viereck), 3 ♂, 4 ♀, 1 juv. ♀,<sup>46</sup> (♂ AVa, x and y for this sex, 23; ♀ A, V to WX, a, y and z, 2 to 23; juv. AV), [A. N. S. P.].

Alamogordo, IV, 25, 1902, (R.), 1 juv. ♂,<sup>47</sup> (EZ 5 but with body barred); VII, 12 and 13, 1907, (R. & H.); in dead yucca on desert and at light), 4 ♂, 4 ♀,<sup>48</sup> (♂ A but mouth parts slightly pale, greatly suffused reddish Z, d, w and x, 34 and 3; 3 ♀ similar but a, e and suffused g, y 3; 1 ♀ AVau 2); (G. von Krockow), 1 ♂, 1 ♀, (dark reddish brown, reddish Z, d and g, 3), [Am. Mus. Nat. Hist.].

<sup>43</sup> Recorded by Rehn as *Gryllus pennsylvanicus*.

<sup>44</sup> In some features this series shows greater variability than any other before us from the southwestern United States.

<sup>45</sup> Recorded by Rehn as *Gryllus pennsylvanicus*.

<sup>46</sup> Recorded as *Gryllus integer* by Rehn.

<sup>47</sup> Recorded as *Miogryllus lineatus* by Rehn.

<sup>48</sup> Recorded by the authors as *Gryllus alogus* but one female as *Gryllus pennsylvanicus*.

Las Cruces, VIII, 7, 1 ♂, (B, suffused Z, gu 3), [A. N. S. P.].

Aden, 4300 feet, VII, 21, 1907, (H.; under stones on desert hillside and on grass prairie), 1 ♂, 1 ♀,<sup>49</sup> 1 juv. ♂, (A but mouth parts reddish, suffused reddish Z, d and e, y 3; juv. EZ 3 but with body barred).

Deming, VII, 19, 1907, (R. & H.; at light), 2 ♂, 3 ♀,<sup>50</sup> (2 ♂ 1 ♀ A, WX and suffused reddish Z, a and dg, u and x, 3; 2 ♀ B, suffused reddish Z, gu 3).

Lordsburg, at 4500 feet, X, 15, 1910, (R. & H.; eroded cracks on bare plain), 1 ♀, (EZfu 23).

#### *Nevada.*

Las Vegas, 2026 feet, VIII, 9, 1907, (R. & H.; in crack in building), 1 ♂, (head dark brown with mouth parts paler, rest of insect uniform pale brown, w 3); IX, 1 and 2, 1909, (R. & H.; at light), 13 ♂, 15 ♀, (11 ♂ A but palest examples with mouth parts slightly pale, WX and reddish suffused Z, a to de, u, 3 to 34; 6 ♀ A, WX and reddish suffused Z, au 3; 4 ♀ A, suffused Z, dgu 3; 3 ♀ weakly B, weakly suffused Z; dg to g, u 3; 2 ♂ 2 ♀ E, Z and Y, d and f, u 3).

#### *Arizona.*

Flagstaff, VII, 5, 1892, 1 ♀, (A, reddish Z, az 34), [Hebard Cln.]; VII, 12 and 13, 1902, (E. J. Oslar), 9 ♀,<sup>51</sup> (1 ♀ AVWav 23; 1 ♀ EYcu 2; 7 ♀ EZ, f and g, u 2), [A. N. S. P.].

Phoenix, IV, 23, 1902, (E. J. Oslar), 1 ♂, 2 ♀,<sup>52</sup> (♂ EZgu 2; ♀ BZgu 3), [A. N. S. P.]; VI, 18 to XI, 18, 1899 to 1901, (R. E. Kunzé), 6 ♂, 19 ♀,<sup>53</sup> (1 ♂ AVdu 3; 1 ♂ D but no postocular bar, Zdgu 3; 2 ♂ Ydul; 2 ♂ EZ, d and dg, u 2; 2 ♀ AVdu 3; 5 ♀ weakly B, reddish Z, dg, u and be, y 3; 1 ♀ EYbu 2; 11 ♀ EZ, f and g, u, 2 to 3), [Hebard Cln.].

Florence, VI, 8, 1903, (C. R. Biederman), 4 juv. ♂, 2 juv. ♀,<sup>54</sup> VII, 17 to IX, 15, 1903, (C. R. Biederman), 1 ♂, 4 ♀,<sup>55</sup> (1 ♂ A, reddish Z, du 3; 2 ♀ A with mouth parts slightly pale, XYeu 3; 1 ♀ B, reddish Z, dgu 3; 1 ♀ EZgu 2), [all A. N. S. P.].

Tucson, 2400 feet, VII, 23 to 26, 1907 and X, 4, 1910, (R. & H.; at lights in streets), 18 ♂, 16 ♀,<sup>56</sup> (1 ♂ 1 ♀ B, reddish Z, d and e, u 2; 17 ♂ 15 ♀ D to F, YZ to Z, d to g, u, 12 to 2).

San Bernardino Ranch, Cochise County, 3750 feet, VIII,

<sup>49</sup> Recorded by the authors as *Gryllus alogus*.

<sup>50</sup> Recorded by the authors as *Gryllus armatus*.

<sup>51</sup> Recorded by Rehn as *Gryllus personatus*, but one female as *Gryllus pennsylvanicus*.

<sup>52</sup> Recorded as *Gryllus personatus* by Rehn.

<sup>53</sup> Recorded by Rehn as *Gryllus personatus*, *armatus* and *alogus*.

<sup>54</sup> Recorded as *Miogryllus lineatus* by Rehn.

<sup>55</sup> Recorded in part by Rehn as *Gryllus pennsylvanicus* and *personatus*.

<sup>56</sup> Recorded in part by Rehn and Hebard as *Gryllus personatus* and *armatus*.

1905, (F. H. Snow), 1 ♂, 1 ♀,<sup>57</sup> (♂ B, weakly suffused Z, gu 3; ♀ AWYdu 3), [A. N. S. P.].

Carr Cañon, Huachuca Mountains, VIII, 1905, (H. Skinner), 2 ♂, 7 ♀,<sup>58</sup> (2 ♂ 4 ♀ DE and E, suffused Z to Z, d and e, u, 3 to 2; 3 ♀ A but mouth parts pale reddish, reddish Y and Z, byz, 3 and 34), [A. N. S. P.].

Palo Alto Rancho, Altar Valley, ± 3000 feet, X, 10, 1910, (H.; small meadow in tall grass clumps), 1 ♂, (DEYdv 3).

Sentinel, X, 2, 1910, 686 feet, (R. & H.; under boards at night), 3 ♂, 4 ♀, (D to DE, Y, d and e, u but 1 ♀ v, 2 to 3; 1 ♂ 1 ♀ A, weakly reddish X, a and b, u 34)

Yuma, VII, 27, 1907 and X, 1, 1910, (R. & H.; at lights in streets), 22 ♂, 84 ♀,<sup>59</sup> (22 ♂ 81 ♀ weakly to very strongly B to a maximum condition in which the entire pronotum is pale, greatly suffused reddish Y to reddish Z, a to g, u but 1 ♂ w, 23 to 4; 3 ♀ EZeu 23).

#### *British Columbia.*

(G. W. Taylor), 1 ♀, (AWay 4), [Hebard Cln.].

#### *Washington.*

Yakima, (C. V. Piper), 1 ♀, 2 juv. ♀, (1 ♀ AVbv 3; juv. AV), [Hebard Cln.].

#### *Oregon.*

(Washburn), 3 ♂, 4 ♀, (3 ♂ 3 ♀ A, U to UV, a and d, u but 1 ♀ y, 23 to 4; 1 ♀ weakly B, yellowish Z, yellowish g, y 3), [Hebard Cln.].

Portland, VI, 19, 1882, 1 ♀, (AVW, weakly f, x 34), [Hebard Cln.].

#### *California.*

Amador County, 2 ♂, (AVXdv 01), [Am. Mus. Nat. Hist.].

El Portal, Mariposa County, 3200 feet, VIII, 30, 1907, (H.), 1 ♂, (AVXav 3).

Sacramento, VIII, 26, 1910, (R. & H.; at light in streets), 11 ♂, 30 ♀, (A, U UX and VX, d but with extremes from a to dg, u, 2 to 4).

San Francisco, (L. E. Ricksecker), 1 ♀, (weakly B, VXev 02), [A. N. S. P.].

West Berkeley, VIII, 20, 1897, (A. P. Morse), 1 ♂, *cotype* of *Gryllus integer* Scudder, (AVXdu 3), [Hebard Cln.].

Santa Barbara, VIII, 21, 1909, (H.; in grasses at night and under stone, noisy singing day and night), 3 ♂, 1 ♀, (2 ♂ AWXgu 3; 1 ♂ 1 ♀ DZu, 23 and 4).

Santa Rosa Island, 1 ♂, (AVXdu 34), [Am. Mus. Nat. Hist.].

<sup>57</sup> Recorded by Rehn, male as *Gryllus personatus*, female as *Gryllus armatus*.

<sup>58</sup> Recorded by Rehn as *Gryllus personatus* and *alonus*.

<sup>59</sup> Recorded in part by the authors as *Gryllus armatus*.

Los Angeles, VII, 1886, 1 ♂, 2 ♀, (A, VX and suffused reddish Z, dg and g, u, 23 and 4), [Hebard Cln.].

Pasadena, VI, 8, 1907, (F. Grinnell Jr.), 1 ♂, (AWXadv 3), [A. N. S. P.]; VIII, 1, 1907, 824 feet, (R. & H.), 1 ♂, (CZgv 23).

Santa Monica, VIII, 1, 1906, (F. Grinnell, Jr.), 1 juv. ♀, (B with abdominal segments suffused with buff, limbs all buff), [A. N. S. P.].

Avalon, Santa Catalina Island, VIII, 3, 1907, (H.; at light), 1 ♂, (AVXdu 3).

Claremont, (C. F. Baker), 1 ♂,<sup>60</sup> (AVbdv 3), [A. N. S. P.].

San Diego, VII, 28, 1901, (G. W. Dunn), 1 ♂,<sup>61</sup> (CYdu 023), [A. N. S. P.].

Coronado Beach, VIII, 17, 1907, (H.), 1 ♂, (AYdu 023).

Tia Juana, VIII, 16, 1907, (H.), 1 ♂, (CYdu 02).

Lyons, San Bernardino County, 2850 feet, VIII, 11, 1907, (H.), 1 ♂, (all reddish, reddish B, yellowish Z, du 3); IX, 1, 1909, (R. & H.; in bricks), 1 ♂, (AVXbu 23).

Palm Springs, VII, 13, 1897, (A. P. Morse), 1 ♂, *cotype* of *Gryllus vocalis* Scudder, (AXdu 2) [Hebard Cln.]; IX, 28 and 29, 1910, 450 feet, (R. & H.; young everywhere in house between sheets, blankets, etc., and very destructive), 2 ♂, 2 juv. ♂, (♂ A, WX and UX, adv, 3 and 4; juv. D with body and limbs yellowish.)

Tahquitz Cañon, San Jacinto Mountains, 500 to 1200 feet, IX, 30, 1910, (R. & H.), 1 juv. ♂, (B with abdominal segments outlined in buff, limbs all buff).

Fort Yuma at Colorado, 1 ♂, (BZdgu 03), [Hebard Cln.].

#### *Mexico.*

Torreón, Coahuila, X, 30 and XI, 4, 1909, (J. Friesser), 2 ♀, (1 ♀ AVau 3; 1 ♀ ABXdu 023), [Field Mus. Nat. Hist.].

San Miguel, Sonora, IV, 1892, (G. Eisen), 2 ♀, 1 juv. ♀, (AC, Y and Z, dg, u and y, 03 and 4), [Cal. Acad. Sci.].

Comondú, Lower California, III, 1889, (C. D. Haines), 1 ♂, 1 ♀, (♂ CZgu 02; ♀ A but mouth parts reddish, WXdgeu 02), [Hebard Cln.].

San Lázaro, L. Cal., IX, 1894, 1 ♀, (AC, reddish Z, ey 03), [Hebard Cln.].

San José del Cabo, L. Cal., (G. Eisen), 4 ♂, 21 ♀, 2 juv. ♂, 2 juv. ♀, (B to C, Y to Z, e and g, u, 012 to 03, but 1 ♂ A with mouth parts reddish, reddish Z, dy 01), [Cal. Acad. Sci.].

Mazatlán, Sinaloa, (from H. Edwards), 2 ♀, (1 ♀ A with reddish mouth parts, Xdu 03; 1 ♀ BCZey 03), [Am. Mus. Nat. Hist.].

Tepic, 1 ♂, 2 ♀, 1 juv. ♀, (1 ♀ 1 ♀ D, yellowish Z, a and b, y and u, 4 and 01; 1 ♀ ADVYbv 03), [Hebard Cln.].

Guadalajara, Jalisco, VIII, 21 to IX, 19, 1903, (J. F. McClendon) 11 ♂, 6 ♀,<sup>62</sup> (D. L. Crawford), 2 ♂, 6 ♀, (all A to C, VW to Z, d and e, u, 03 to 02), [all A. N. S. P.].

<sup>60</sup> Recorded by Rehn as *Gryllus pennsylvanicus*.

<sup>61</sup> Recorded as *Gryllus assimilis* by Rehn.

<sup>62</sup> *Ibid.*

Zapotlanejo, Jal., VII, 31, 1903, (J. F. McClendon), 1 ♂,<sup>63</sup> (A, reddish Y, du 3), [A. N. S. P.].

Tuxpan, Jal., IX, 4, 1903, (J. F. McClendon), 1 ♀,<sup>64</sup> (D, suffused Z, fxy 3), [A. N. S. P.].

Aguascalientes, Aguascalientes, XI, 1887, (L. Bruner), 1 ♀, (AWdu 03), [Hebard Cln.].

Querétaro, Querétaro, XI, 1887, (L. Bruner), 1 ♀, (A with mouth parts pale reddish, Yeu 3), [Hebard Cln.].

Vera Cruz, Vera Cruz, I, 1892, 1 ♂, 1 ♀, (B, suffused Y, d and b, u, 03 and 023); (T. Heyde), 1 ♂, (B. suffused Y, du 03), [all Hebard Cln.].

Jalapa, V. C., V, 1 ♀, (DE, yellowish Z, dy 3), [Hebard Cln.]; VIII and IX, (O. W. Barrett), 1 ♂, 2 ♀,<sup>65</sup> (B and BC, suffused Z, d e and b, u, 012 to 01), [A. N. S. P.].

Teocelo, V. C., IX, (O. W. Barrett), 1 ♂,<sup>66</sup> (BC, suffused Y, du 012), [A. N. S. P.].

Cordoba, V. C., (H. de Saussure), 1 ♀, determined as *Gryllus mexicanus* Saussure by that author, (D, reddish yellow Z, by 3), [A. N. S. P.].

Orizaba, V. C., I and XI, 1892, 5 ♂, 15 ♀, 1 juv. ♀, (A B C and D, VW suffused Y and Y, a b d and e, w to u, 4 to 23), [Hebard Cln.].

Motzorongo, V. C., II, 1892 and V, 1893, 3 ♂, 2 ♀, (A to C, suffused Z, reddish Z V and W, v and u, 34 to 3), [Hebard Cln.].

San Rafael, V. C., (C. H. T. Townsend), 2 ♀, (D, suffused Z, cfy 3), [Hebard Cln.].

La Buena Ventura near Santa Rosa, V. C., VII, 1909, 2 ♀, (CDZeu 02), [Am. Mus. Nat. Hist.].

Chalchicomula, Puebla, II, 20, 1892, 1 ♀, (DZdy 23), [Hebard Cln.].

Distrito Féderal, VII, 1898, 1 ♂, 6 ♀, (A with mouth parts pale, reddish Z, du, 4 to 34), [Hebard Cln.].

Tacubaya, D. F., II, 1899, 1 ♀, (AWXdfu 34), [Hebard Cln.].

San Angel, D. F., VIII, 28, 1903, (W. L. Tower), 1 ♀, (A, buffy V, bx 34), [Am. Mus. Nat. Hist.].

Cuernavaca, Morelos, V, 22, 1905, (W. L. Tower), 1 ♀, (C, suffused Z, bu 01), [Am. Mus. Nat. Hist.]; VI, (O. W. Barrett), 1 ♂, 3 ♀, ♂ type and 3 ♀ paratypes of *Gryllus barretti* Rehn, (1 ♂ A but mouth parts reddish, heavily suffused Z, du 02; 3 ♀ D, heavily suffused Z, bu 03), [A. N. S. P.].

Iguala, Guerrero, IX, 1898, (O. W. Barrett), 1 ♀, (D, heavily suffused Z, bu 03), [A. N. S. P.].

Cocula, Gro., XII, 1898, (O. W. Barrett), 1 ♂, 1 ♀, (D, heavily suffused Z, d and b, u 03), [A. N. S. P.].

<sup>63</sup> Recorded by Rehn as *Gryllus mexicanus*.

<sup>64</sup> Recorded by Rehn as *Gryllus barretti*.

<sup>65</sup> Recorded by Rehn as *Gryllus assimilis*.

<sup>66</sup> *Ibid.*

Yucatan, (Schott), 1 ♂, 1 ♀,<sup>67</sup> (AD, heavily suffused Z, du 02), [A. N. S. P.], (dried alcoholic).

Ticul, Yucatan, 1 juv. ♂, 1 juv. ♀,<sup>68</sup> (juv. ♂ E), [A. N. S. P.], (dried alcoholic).

#### Nicaragua.

II, 1893, (B. Shimek), 1 ♀, (A with mouth parts pale, UXdx 3), [Hebard Cln.].

San Ramon, Rio Wanks, V to VI, 1905, (W. S. Palmer), 1 ♂, (C, suffused Z, dx 03), [Hebard Cln.].

#### Costa Rica.

Caché, 1000 meters, V, 1905, (P. Biolley), 1 ♂, 1 ♀, (♂ AD, suffused reddish Y, dx 02; ♀ A with mouth parts pale, Vbu 02), [A. N. S. P.].

San José, II, 1903, (C. F. Underwood), 1 ♂, 2 ♀, (1 ♂ very strongly C, Z gu 02; 1 ♀ A with mouth parts pale, heavily suffused Y, bu 02; 1 ♀ weakly defined D, reddish Z, bxy 3), [Hebard Cln.].

Monte Redondo, Candelaria Mountains, III, 1902, (L. Bruner), 1 ♂, (B, suffused Y, dgw 034), [Hebard Cln.].

San Vicente, (J. F. Tristan), 1 ♂, 3 ♀, (B and weakly defined D, heavily suffused Y, d b and e, w and y, 3 to 4), [A. N. S. P.].

Tablazo, 1900 meters, VII, 1905 to IX, 1906, (P. Biolley), 4 ♂, 4 ♀, 1 juv. ♀, (AB and D, W reddish V and suffused Z, d and b, x and u, 4 to 03), [A. N. S. P.].

Pózo Azul de Pirrís, (M. A. Carricker, Jr.), 3 ♂, 2 ♀, (AD and AB, suffused Y, d, u and x, 03 and 023), [Hebard Cln.].

Gulf of Nicoya, 5 ♀, (AB, heavily suffused Z, ab, u and w, 034 to 01), [Hebard Cln.].

Pacayas, 1430 meters, III, 1906, (P. Biolley), 2 ♂, 2 ♀, (B, reddish Y, dv 34), [A. N. S. P.].

#### Bermuda.

St. George Island, II, 23, 1909, (F. M. Jones), 1 ♀,<sup>69</sup> (AC, heavily suffused Z, bu 023), [A. N. S. P.].

Warwick Parish, IV, 11 to V, 9, 1909, (F. M. Jones), 7 ♂, 14 ♀,<sup>70</sup> (A to C, heavily suffused Z to Z, b and d to f, u to w, 45 to 023), [A. N. S. P.].

Paget West, XII, 14, 1908 to V, 9, 1909, (F. M. Jones), 10 ♂, 8 ♀,<sup>71</sup> (A to C, heavily suffused Z to Z, d to f, u to w, 5 to 023), [A. N. S. P.].

Somerset Island, Sandys Parish, II, 21, 1912, (M. Hebard), 1 juv. ♂, (CV), [Hebard Cln.].

<sup>67</sup> Recorded as *Gryllus barretti* by Rehn.

<sup>68</sup> Recorded as *Gryllodes toltecus* by Rehn.

<sup>69</sup> Recorded as *Gryllus bermudensis* by Rehn.

<sup>70</sup> *Ibid.*

<sup>71</sup> *Ibid.*

*Bahamas.*

Grant Town, New Providence Island, II, 3, 1904, (M. Hebard), 1 ♂, 2 ♀,<sup>72</sup> (strongly C, Zdu 023), [Hebard Cln.].

*Cuba.*

Vinales, Pinar del Rio, IX, 16 to 22, 1913, (Lutz and Leng), 2 ♀, (DZdu, 03 and 01), [Am. Mus. Nat. Hist.].

El Guama, Pinar del Rio, (Palmer and Riley), 2 ♀, (C and D, Z, d and g, u, 3 and 03), [A. N. S. P.].

Guanajay, Pinar del Rio, V, 6, (Palmer and Riley), 1 ♀,<sup>73</sup> (CD, suffused Z, du 01), [A. N. S. P.].

Havana, I, 1904, (M. Hebard), 1 ♀,<sup>74</sup> (strongly D, Zey 03), [Hebard Cln.].

Francisco, Camaguey, (Mrs. J. S. Durham), 1 ♂, 1 ♀, (C, Z and suffused Z, ad and ab, u 02), [A. N. S. P.].

Santiago, XII, 11, 1903, 2 ♂,<sup>75</sup> (C, suffused Z, du, 02 and 01), [A. N. S. P.].

San Carlos Estate, Guantanamo, X, 4 to 8, 1913, (F. E. Lutz), 3 ♂, 1 ♀, (CZ, d and B, u 012), [Am. Mus. Nat. Hist.].

*Porto Rico.*

Mayaguez, II, 15 to 16 and VII, 24 to 29, 1914, 2 ♀, (AD, suffused Z, bu, 012 and 01), [Am. Mus. Nat. Hist.].

Ponce, VII, 20 to 22, 1914, 1 ♀, (DZbu 02), [Am. Mus. Nat. Hist.].

*Jamaica.*

Montego Bay, X, 29 to XI, 2, 1913, (M. Hebard), 1 ♀, 1 juv. ♀; XI, 1913 to III, 1914, (C. G. Hussey; 1 at light), 3 ♀, (all C, suffused Y to Z, b to g, u 012), [all Hebard Cln.].

*Lesser Antilles.*

Roseau, Dominica, VI, 22 to VII, 3, 1911, (Crampton and Lutz), 2 juv. ♂, [Am. Mus. Nat. Hist.], (dried alcoholic).

Soufisse, St. Lucia, V, 7, 1903, (H. A. Ballou), 1 ♀,<sup>76</sup> (very weakly D, suffused Z, dw 03), [A. N. S. P.].

Barbados, IX, 22, 1902 to VI, 2, 1903, (Ballou, Lefroy and Todd), 5 ♂, 7 ♀, 1 juv. ♀,<sup>77</sup> (A to C, UZ to Z, a b and d, u to w, 3 to 02), [A. N. S. P.].

<sup>72</sup> Recorded as *Gryllus assimilis* by Rehn.

<sup>73</sup> Recorded as *Gryllus capitatus* by Rehn.

<sup>74</sup> Recorded as *Gryllus assimilis* by Rehn.

<sup>75</sup> Recorded as *Gryllus capitatus* by Rehn.

<sup>76</sup> Recorded by Rehn as *Gryllus assimilis*.

<sup>77</sup> *Ibid.*

Halton, Barbados, X, 25, 1902, (C. Todd), 1 ♂, 2 ♀,<sup>78</sup> (C and B, Z, d and e, u, 34 to 03), [A. N. S. P.].

#### *Colombia.*

Cincinnati Plantation near Santa Marta, 4000 to 5000 feet, VII, 9 and 10, 1913, (M. A. Carriker Jr.), 1 ♂, (A, buffy VW, au 02), [Hebard Cln.].

#### *Trinidad.*

Caparo, VI and VIII, 1913, (S. M. Klages), 7 ♂, 9 ♀, (BC to C, greatly suffused Z to Z, d a and b, u, 023 to 012), [A. N. S. P. and Hebard Cln.].

#### *British Guiana.*

Bartica, IV, 4, 1901, (R. J. Crew), 1 ♂, (A, greatly suffused Y, dx 02); (H. S. Parish), 1 ♂, (AC, greatly suffused Y, du 02), [all A. N. S. P.].

#### *Brazil.*

Pará, Pará, (C. F. Baker), 1 ♂, 1 ♀, (C, Z and suffused Z, weakly f and b, u 02), [A. N. S. P.].

Igarapé Assu, Pará, (H. S. Parish), 2 ♀, (A with mouth parts pale, weakly reddish W, intense b, u 023), [A. N. S. P.].

Tijuca, Rio de Janeiro, IV, 9 to 11, 1913, (M. Burr), 1 ♀, (ADW, strongly b, u 03), [A. N. S. P.].

Rio Grande do Sul, (Dr. Ihering), 1 ♂, determined as *Gryllus argentinus* Saussure by that author, (AWgv 023), [A. N. S. P.].

#### *Paraguay.*

Sapucay, II, 17 to VII, 1902 and 1905, (W. T. Foster), 3 ♂, 5 ♀,<sup>79</sup> (1 ♂ 1 ♀ FZgu 023; 1 ♀ DZgu 02; 2 ♂ 1 ♀ A with mouth parts weakly reddish, W and X, d and b, ♂ v ♀ u, 023 to 02; 2 ♀ weakly and strongly C, suffused reddish Y and suffused reddish z, ev, 03 and 02), [Hebard Cln.].

#### *Argentina.*

Misiones, XII, 30 and I, 1910 and 1911, (P. Jorgensen), 2 ♀,<sup>80</sup> (1 ♀ A with reddish mouth parts suffused reddish Z, eu 03; 1 ♀ AVbu 02), [A. N. S. P.].

Salta, Salta, 1 ♂, 1 ♀, (weakly C, V and WY, d and b, u, 02 and 01), [A. N. S. P.].

Jujuy, Jujuy, IV, 1911, (P. Jorgensen), 1 ♀, (AUVbu 02), [A. N. S. P.].

Buenos Aires, (M. G. Claraz), 1 ♀, cotype of *Gryllus argentinus* Saussure (AVXcu 012), [A. N. S. P.].

<sup>78</sup> Recorded by Rehn as *Gryllus assimilis*.

<sup>79</sup> Recorded as *Gryllus assimilis* and *argentinus* by Rehn.

<sup>80</sup> Recorded by Rehn as *Gryllus argentinus*.

La Combre, Cordoba, (C. Lizer), 2 ♀, (1 ♀ AXdw 03; 1 ♀ AVXew 012), [A. N. S. P.].

Chacras de Coria, Mendoza, 936 meters, (P. Jorgensen), 1 ♂, 3 ♀,<sup>81</sup> (1 ♂ A with mouth parts reddish, dark reddish Z, gw 023; 1 ♀ AX, intense f, w 02; 2 ♀ AVXfw 023), [A. N. S. P.].

Mendoza, Mendoza, 767 meters, (P. Jorgensen), 1 ♂,<sup>82</sup> (AUVbu 02), [A. N. S. P.].

*Galapagos Islands.*

Chatham Island, 1 juv. ♂, 1 juv. ♀, (greatly suffused Z), [Hebard Cin.], (dried alcoholic).

*Ecuador.*

Duran, VI, 14 to 24, 1914, (H. S. Parish), 5 ♂, 7 ♀, (C to D with color pattern further defined by longitudinal median occipital lines, greatly suffused Z to Y and Z, d and b, u, 023 to 012), [A. N. S. P.].

*Peru.*

Contamano, Rio Ucayali, X to XII, 1912, 2 ♀, (1 ♀ A with mouth parts reddish, VX, intense C, u 02; 1 ♀ C, reddish Z, dfu 02), [A. N. S. P.].

Chanchamayo, 1 ♂, 1 ♀, (A with mouth parts reddish, dark reddish Z and V, d and b, v and u, 02), [A. N. S. P.].

Lima, VIII, 19, 1914, (H. S. Parish), 1 ♂, (pale D, Zdx 02), [A. N. S. P.].

*Chile.*

Rancagua, O'Higgins, XI, 1903, (C. S. Reed), 5 ♂, 3 ♀, (A, W to deep reddish Z, dg and weakly f, v, 03 to 012), [A. N. S. P.].

Rengo, Colchagua, XII, 1903, (C. S. Reed), 3 ♂, 2 ♀, 2 juv. ♀, (A, V to suffused Z and reddish Z, d f and g, u to x, 03 to 02), [A. N. S. P.].

Concepcion, XI, 1903, (C. S. Reed), 1 ♂, 2 ♀, (A, suffused reddish Z, g and fg, v, 03 and 02), [A. N. S. P.].

Gultso, XI, 1903, (C. S. Reed), 1 ♂, 1 ♀, (A, X and V, dg and f, v 012), [A. N. S. P.].

*Gryllus domesticus* Linnæus.

1758. [*Gryllus (Acheta) domesticus* Linnæus, Syst. Nat., ed. X, I, p. 428. [Europe, in walls of houses.]

The present species is readily distinguished from all manifestations of *G. assimilis* by its more slender form and distinctive color pattern. The titillatores of the male are also distinctive and may be described as follows: the corneous portion constitutes a thin plate, semi-circular in transverse section, with distal margin weakly produced meso-dorsad and broadly obtuse-angulate with weakly concave

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<sup>81</sup> Recorded by Rehn as *Gryllus argentinus*.

<sup>82</sup> *Ibid.*

sides; below the ventro-lateral margins of this portion on each side, rests a somewhat more thickened, narrow, corneous plate which is exteriorly nearly horizontal at the base, but produced and upcurved with blunt apex reaching a little distad of the apex of the dorsal portion, inside at the juncture with the dorsal portion this ventro-lateral portion is strongly concave thus forming claw-like projections which hold in the seminal sac without pressing upon it at any point. (See Plate IV, figs. 11 and 12.)

The species has been accidentally introduced by man from Europe and is now widely distributed through temperate North America. It has in the past been recorded from Montreal, Quebec; Connecticut; New York, New York; New Brunswick, New Jersey; Ohio; Lexington, Kentucky; West Terre Haute, Indianapolis and Putnam County, Indiana; Moline and Urbana, Illinois; Minnesota, and Omaha, Nebraska.

The insect inhabits dwellings, greenhouses, etc., where it is sometimes found in large numbers. The species is decidedly more alert and active than *assimilis*, in its movements more nearly resembling the extremely rapid *Gryllodes sigillatus*, which tropical species also appears to prefer the proximity of man.

The series recorded below are in general coloration yellowish brown, the specimens from Chicago, Illinois, and Albany, Georgia, are slightly darker than normal with caudal femora weakly suffused.

*Specimens Examined:* 27; 7 males, 14 females, 2 immature males and 4 immature females.

- West Farms, New York, 1 ♀, [U. S. N. M.].
- Harrisburg, Pennsylvania, XI, 18, 1 juv. ♂, [Pa. State Dept. Zool.].
- Philadelphia, Pa., IX, 30, 1914, (E. R. Casey; on Logan Square), 1 ♀, [Casey Cln.].
- West Philadelphia, Pa., IX, 14 and 16, 1901, (W. Stone; in house), 3 ♂, 2 ♀, 3 juv. ♀, [A. N. S. P.].
- Carolina, 1 ♀, [U. S. N. M.].
- Roswell, Georgia, (King), 1 ♂, [U. S. N. M.].
- Albany, Ga., VIII, 1, 1913, (H.; under sign on oak tree), 1 juv. ♀.
- Thomasville, Ga., IV, 1901, (H.; in house on lamp shade at night), 1 ♀.
- Utaw, Alabama, 2 ♀, [U. S. N. M.].
- Chicago, Illinois, (W. J. Baumgartner; in greenhouse), 1 ♂, 1 ♀, [A. N. S. P.].
- St. Anthony Park, Minnesota, IX, 9, 1896, (O. Lugger), 1 ♀, [Hebard Cln.].
- Lincoln, Nebraska, 1 ♀; V, 18, 1901, (M. Cary; at light), 1 ♀, [both Hebard Cln.].

San Antonio, Texas, 1885, (M. Newell), 2 ♀, [Hebard Cln].

Laredo, Tex., VIII, 12, 1912, (H.); very common in town and exceedingly active, always in inaccessible holes and dark places in stores, walls, etc.), 2 ♂, 1 juv. ♂.

#### PLATE IV.

The outlines are very greatly enlarged, the stipple figures over twice natural size.

1. *Gryllus assimilis* (Fabricius), *assimilis* variant. Tia Juana, California. Male. Dorsal view of head.
2. *Gryllus assimilis* (Fabricius), *personatus* variant. Tucson, Arizona. Male. Dorsal view of head.
3. *Gryllus domesticus* Linnaeus. San Antonio, Texas. Female. Dorsal view of head.
4. *Gryllus assimilis* (Fabricius), *mexicanus* variant. Chalchicomula, Mexico. Facial aspect.
5. *Gryllus assimilis* (Fabricius), *personatus* variant. Sentinel, Arizona. Male. Facial aspect.
6. *Gryllus assimilis* (Fabricius), *personatus* variant. Tucson, Arizona. Female. Facial aspect.
7. *Gryllus assimilis* (Fabricius), *personatus* variant. Tucson, Arizona. Male. Facial aspect.
8. *Gryllus assimilis* (Fabricius), *pennsylvanicus* variant. Raleigh, North Carolina. Lateral outline of male titillatores.
9. *Gryllus assimilis* (Fabricius), *pennsylvanicus* variant. Raleigh, North Carolina. Ventral outline of male titillatores.
10. *Gryllus domesticus* Linnaeus. San Antonio, Texas. Female. Facial aspect.
11. *Gryllus domesticus* Linnaeus. Philadelphia, Pennsylvania. Lateral outline of male titillatores.
12. *Gryllus domesticus* Linnaeus. Philadelphia, Pennsylvania. Ventral outline of male titillatores.

The similarity between the *mexicanus* variant and darkest examples of the *personatus* variant are shown by figs. 4 and 5. In the *personatus* variant every condition between figs. 5 and 7 is found in the material before us, though the great majority of specimens show the strongly defined color pattern.

The male titillatores are, in all the variants of *assimilis*, as shown in figs. 8 and 9.



1



2



3



4



5



6



7



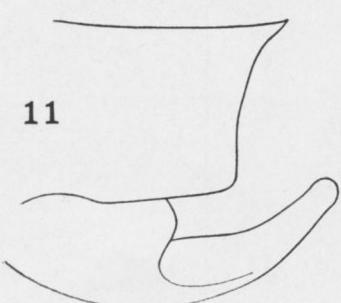
8



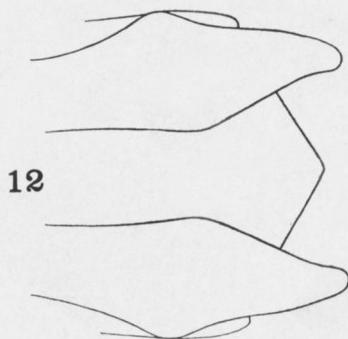
9



10



11



12